AG Contract No.KR98 2083TRN
ADOT ECS File: JPA 98-156
Project No. H5170 01X
Research: ATLAS Research Center
Program Administration

INTERAGENCY AGREEMENT
BETWEEN
THE DEPARTMENT OF TRANSPORTATION
AND
THE UNIVERSITY OF ARIZONA

THIS AGREEMENT is entered into _28 October_ , 1998, between agencies of the State of Arizona, to wit; the DEPARTMENT OF TRANSPORTATION (the "DOT") and the ARIZONA BOARD OF REGENTS, acting for and on behalf of UNIVERSITY OF ARIZONA, (the "University").

I. RECITALS

1.   The DOT is empowered by Arizona Revised Statutes Section 28-401 and 28-334 to enter into this agreement and has by resolution, a copy of which is attached hereto and made a part hereof, resolved to enter into this agreement and has delegated to the undersigned the authority to execute this agreement on behalf of the DOT.

2.   The University is empowered by Arizona Revised Statutes Section 15-1626 to enter into this agreement and has delegated to the undersigned authority to execute this agreement on behalf of the University.

3.   The Transportation Efficiency Act – 21st Century (TEA21) has allocated federal funds in the amount of $1,000,000.00 to be administered by the State to establish the Center for Excellence in Advanced Traffic and Logistics Algorithms and Systems (ATLAS) at the University. The mission of the ATLAS Center will be to perform advanced transportation technology, traffic and logistics management research. This agreement is to define the terms of the transfer of funds from the State to the University and the expenditure thereof.

THEREFORE, in consideration of the mutual agreements expressed herein, it is agreed as follows:
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II.   SCOPE OF WORK

    1.   The DOT will:

        a. Appoint a Project coordinator to interface with the University relating to the ATLAS program research and various project development.

        b. Provide the University with information and data as may be reasonably available to assist in project research and development.

        c. Reimburse the University at eighty percent (80%) of allowable and allocable costs of work performed directly relating to the ATLAS program within forty-five (45) days after receipt and approval of monthly invoices, in a total reimbursement amount not to exceed $1,000,000.00.

    2.   The University will:

        a. Appoint a Project coordinator at the University (U of A) to interface with the DOT relating to the ATLAS program research and various project development.

        b. Accomplish the work generally in accordance with Exhibit A, which is attached hereto and made a part hereof, provide the DOT monthly, quarterly and final project reports and other deliverables; (as are specifically defined in Section 2.7 of Exhibit A, and in Sections 9 - 13 of the FHWA-ADOT Program proposal, which is attached hereto as Exhibit B and made a part hereof) such reports will be accompanied by a summary of expenditures.   Such reports will be in a format compliant with the FHWA as described in the University proposal, and provide copies of same to the DOT.

        c. No more often than monthly, invoice the DOT in the form of Exhibit C attached hereto.

III. MISCELLANEOUS PROVISIONS

    1.   Title to all documents, reports and other deliverables prepared by the University in performance of this agreement shall rest jointly with the federal government, the DOT and the University.

    2.   This agreement shall become effective upon signature by the parties hereto, and shall remain in force and effect until completion of said ATLAS project and reimbursements; provided, however, that this agreement, may be cancelled at any time prior to the commencement of performance under this agreement, upon thirty (30) days written notice to the other party.

    3.   The parties agree to comply with all applicable state and federal laws, rules, regulations and executive orders governing procurement,   equal   employment   opportunity,   immigration, nondiscrimination and affirmative action.

    4.   This agreement may be cancelled in accordance with Arizona Revised Statutes Section 38-511.

5.   The provisions of Arizona Revised Statutes Section 35-214 are applicable to this contract.

6.   In the event of any controversy which may arise out of this agreement, the parties hereto agree to abide by required arbitration as is set forth for public works contracts in Arizona Revised Statutes Section 12-1518.

7.   All notices or demands upon any party to this agreement relating to the agreement shall be in writing and shall be delivered in person or sent by mail addressed as follows:

    Department of Transportation   University of Arizona
    Joint Project Administration   Research & Contract Analysis
    205 S. 17th Avenue - 616E   ~~2030 E. Speedway-Room 222~~ 888 NEuclid Ave #412
    Phoenix, AZ 85007   Tucson, AZ 857~~19~~ PoBox 210158 UofA
                                                    21

8.   The parties recognize that performance by the U of A under this Agreement may be dependent upon the appropriation of funds by the U.S. Department of Transportation, Federal highway Administration. Should the government at any time fail to assign the necessary funds for such performance, the DOT or the U of A may cancel this agreement.

9.   Should the work contemplated under this agreement be completed at a lower cost than the reimbursed amount, or for any other reason should any of these funds not be expended, a proportionate amount of the funds provided shall be reimbursed to the State.

IN WITNESS WHEREOF, the parties have executed this agreement the day and year first above written.

                        STATE OF ARIZONA

THE ARIZONA BOARD OF REGENTS   DEPARTMENT OF TRANSPORTATION
acting for and on behalf of
THE UNIVERSITY OF ARIZONA

By _LeeAnne J Peters_   By _Tim Wolfe_
    LEEANNE PETERS   TIM WOLFE
    Financial Analyst Principal   Ass't State Engineer
    Office of Research and
    Contract Analysis

RESOLUTION

BE IT RESOLVED on this 27th day of August 1998, that I, the undersigned MARY E. PETERS, as Director of the Arizona Department of Transportation, have determined that it is in the best interests of the State of Arizona that the Department of Transportation, acting by and through the Intermodal Transportation Division, to enter into an agreement with the University of Arizona for the purpose of defining responsibilities for establishing the University Atlas Research Center.

Therefore, authorization is hereby granted to draft said agreement which, upon completion, shall be submitted to the Assistant State Engineer for approval and execution.

DAVID ALLOCCO, Manager
Engineering Technical Group
for Mary E. Peters, Director

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PART I

Center for Excellence in Advanced Traffic and Logistics Algorithms and Software (ATLAS).

1.1 Background

1.1.1 ITS Background

The United States is moving from the enormously successful Interstate Highway construction program into new programs that will set the course of not only highway transportation but rail, transit and multimodal systems as well into the twenty-first century. Decisions on these new programs will determine the capacity, safety, and viability of highway operations for present and future generations, just as the Interstate program did 35 years ago. Also like the Interstate system, Intelligent Transportation Systems (ITS) will become part of the day-to-day activities of doing business in the U.S., by improving the efficiency of the transport of goods, services, and travelers over the entire transportation system, and increasing the level of safety.

Where appropriate, the ITS program involves public/private partners in joint ventures. The program develops, tests, and deploys advanced electronics technology and systems to meet the increasingly critical operational needs of the transportation system such as passenger information and fleet management systems. ITS complements the other transportation improvement programs such as infrastructure preservation and construction of new transportation facilities.

ITS is being implemented in phases, and will evolve over time. Some elements are currently being implemented while others require further research, development and testing. As newer technologies mature, they will be tested for technological soundness, safety, benefits, and market demand before implementation.

The ITS program was described in the 1996 Report to Congress (page xii) as consisting of six broad areas of interest. Each of these six focus on different applications of ITS technology to transportation highway systems needs or on research and education opportunities.

1.1.2 University of Arizona Background

Since 1991, the College of Engineering and Mines has been conducting research in the area of Intelligent Traffic Control Systems, funded continuously through grants and contracts from the Federal Highway Administration, the Arizona Department of Transportation, the Maricopa Association of Governments, the Pima Association of Governments, and the City of Tucson. In addition, faculty from the College has developed software tools to manage emergency response systems for the Tucson Fire Department and the Arizona Department of Public Safety. Also, along with the University's Office of Economic Development and the National Law Center for Inter-American Trade, the faculty has been studying technologies and systems to improve traffic and movement of goods across the border. Lastly, through contracts and grants with other agencies, such as the National Science Foundation, and with firms, such as Modular Mining and AT&T, or simply through internal project assignment, faculty have developed innovative methods for logistics management, such as scheduling resources (trucks, cranes, containers, storage space, etc.), designing networks, siting facilities, routing and scheduling of vehicles (trucks, buses, cargo ships, etc.), and designing decision support systems.

A particular highlight in these endeavors is the development of *RHODES*, an innovative computer-based traffic control system, done through the College's Systems and Industrial Engineering

Department. In laboratory testing it has proven to be among the most effective traffic control systems dealing with congestion and widely varying traffic conditions (the first such system developed in the US). Various state and federal agencies have recognized the potential of *RHODES* and have scheduled field operational testing in the Cities of Tucson, Tempe, and Seattle (WA). It is quite likely that some cities in Canada will also field test *RHODES* in the near future. Also, agencies in other countries, specifically Singapore and Italy, have expressed interest in a modification of *RHODES* for their environment.

Successes in research in traffic and logistics management have not gone unnoticed. The City of Tucson has helped establish the *Living Laboratory for Transportation Technologies* to implement and test off-the-shelf equipment for traffic management. The College and the University have provided some seed funding for the SIE Department to establish a *Program on Research in Emerging Technologies for Transportation Engineering*.

The University of Arizona is planning to establish a Center for Excellence in Advanced Traffic and Logistics Algorithms and Software (*ATLAS*). This Center will consolidate and enhance the above mentioned research activities. The Center will also provide advanced educational programs and workshops in these areas for students, practicing engineers and managers, and researchers. It will seek collaborations with interested faculty and experts in these areas from other colleges within University of Arizona (e.g., MIS Department in the College of Business and Public Administration, and Geography and Regional Development Department in the College of Social and Behavioral Sciences), from its sister universities in Arizona (ASU and NAU), from other universities in the U.S. (preliminary discussions with experts at U. Pennsylvania, Cornell, Purdue, Stanford, Princeton, U. Illinois, U. Wisconsin and U. Utah are underway) and elsewhere (preliminary discussions with experts at U. Rome (Italy), U. Barcelona (Spain), U. Queensland (Australia), City University of Hong Kong, Delft Technical University and U. Singapore are underway) and from industries and agencies (e.g. MITRE, Sabre Decision Technologies, I2 Technologies, Modular Mining, etc.). It is envisioned that the *ATLAS* will become a world-renowned center of excellence in research on traffic and logistics management, where students, researchers, engineers, and managers will be attracted for learning and for pushing the state-of-the-art and state-of-the-practice in traffic and logistics management.

This proposal seeks support from USDOT for ITS related activities within the *ATLAS* Center. It is envisioned that this support will form the backbone for the *ATLAS* infrastructure and will fund the primary missions of (1) research and development of algorithms and software that have high potential benefits for public agencies (such as FHWA, ADOT, cities' traffic engineering departments, and ports) and affiliated organizations (such as operators of intermodal facilities, border crossings, electronic toll collection, providers of traffic management and control systems, emergency service systems, public transit companies, etc.) and (2) education and technology transfer to build the nation's ITS professional capacity.

In addition, it is envisioned that the *ATLAS* Center will seek support, partnerships, and collaborations with other public agencies and private sector companies to (1) develop algorithms and software dealing with other important traffic and logistics management issues (e.g., ground control for airlines/airports and cargo logistics systems for railroads) that are not currently within the scope of ITS goals and (2) fund international projects and collaborations (e.g., development of global distribution systems for express delivery of cargo).

1.2 Introduction, Mission, and Goals of the ATLAS Center

Two major factors in the economic competitiveness of a country and the quality of life of its people are (1) the mobility of people to move easily between home and workplace and other destinations, minimizing the attendant impact on clean air, and (2) the efficient movement of goods from point of

origin to points of destinations. Thus, economic competitiveness and people's quality of life can be enhanced considerably by better management of vehicular traffic on the road network through advances in, for example. traffic-adaptive signal control and ramp-metering, demand management through congestion pricing. and real-time dynamic network load control. This we refer to as Advanced Traffic Management.

Economic competitiveness can also be enhanced by better management of logistics dealing with the movement of goods through advances in, for example, scheduling of resources (trucks. cranes. containers, warehouses, etc.) for intermodal facilities, electronic clearance at border crossings. methods for routing and scheduling of carriers (trucks, cargo ships, airplanes. etc.), decision support systems for designing distribution networks and making better logistics decisions by carriers. Included in Advanced Logistic Management issues is the global distribution of manufactured goods, where consideration of world-wide shipping and supply-chain management can improve the efficiency and cost of goods movement.

1.2.1 Vision Statement

It is envisioned that, within the next five years, The Center for Advanced Traffic and Logistics Algorithms and Software (*ATLAS*) at the University of Arizona will be an internationally and nationally recognized resource for excellence in research and learning of technologies, algorithms and systems for efficient and effective traffic and logistics management. Public agencies and private firms will seek out *ATLAS* for assistance in assessing research needs and conducting research and development projects. *ATLAS* will be a continuing source of talented researchers and graduates who are engaged in researching, developing and deploying the state-of-the-art traffic and logistics management systems.

1.2.2 ATLAS Mission

The mission of the University of Arizona's *ATLAS* Center is to establish a global research center that conducts basic research on advanced technologies and methods for traffic and logistics management, aggressively develops algorithms and software for that purpose, assists in the implementation of this research, and enhances education and technology transfer activities that advance the state-of-the-practice in traffic and logistics management. In more detail, the mission of *ATLAS* is:

1. *ATLAS will conduct basic and applied research on technologies (including communication and computer technologies) and methods (including algorithms and software) for traffic and logistics management, with the goal to make the implementation of systems for this purpose effective, efficient, and economical.*

2. *ATLAS will enhance, through course and curricular development, the current traffic and logistics related teaching activities at UA; it will provide the education that relates to the understanding of technologies, methods and systems, and their implementation, for traffic engineers, logistics managers/planners, transportation practitioners, shippers, cargo carriers, system operators and other related decision makers.*

3. *ATLAS will assist in the effective transfer of Intelligent Transportation Systems and other computer/communication technologies. and traffic and logistics management software, to the transportation industry(including roads, ports, and border crossings operators), private companies and public agencies, through seminars, short courses and participation in operational tests and demonstration projects*

1.2.3 Programmatic Goals of the ATLAS-ITS Program

In the sequel, we will refer to the ITS Program within the *ATLAS* Center as the *ATLAS-ITS* Program. Based on the vision and mission of the *ATLAS* Center, the programmatic goals of the *ATLAS-ITS* Program are the following.

- Devise and implement an objective process for selecting and reviewing research based on the *ATLAS* mission and USDOT strategic national objectives.
- Build research and educational partnerships with the private sector, federal state and local government agencies (outside of USDOT), and/or other academic institutions.
- Incorporate and balance innovative, long-range high-risk ITS research projects with short-term applied research activities (like short- and long-term operational needs, institutional issues, or demonstration tests).
- Emphasize modal, intermodal and multimodal surface transportation issues consistent with the Strategic Plans of the USDOT modal agencies and their annual research needs.
- Assist in the development of means to integrate various technologies including systems architecture, transportation systems analysis, modeling and simulation, databases and databases management, communications, safety and human factors, and software design and development.
- Allow for changes and assignment of different activities to the Center as part of the annual program plan process.

1.2.4 Professional Capacity Building, Educational and Technology Transfer Goals of the ATLAS-ITS Program

Professional capacity building, educational and technology transfer goals of the ATLAS-ITS Program are to:

- Assist in the advancement of skills of today's state and local transportation agencies to operate and maintain various traffic and logistics management & control systems (Professional Capacity Building).
- Assist in the effective transfer of ITS and other computer/communication technologies, and traffic and logistics management software, to transportation agencies, industries and companies.
- Actively cooperate with the UTC and Council of University Centers schools to transfer ITS research into curriculum development.
- Attract and retain highly qualified faculty members, researchers, and students who are, or are expected to become, recognized experts in advanced traffic and logistics management algorithms and systems, and who reflect the growing diversity of the U.S. work force.
- Provide opportunities for visiting industry, academic & government representatives to have work experiences in technologies and methods developed at the *ATLAS* Center.
- Provide opportunities for faculty, staff and students to spend extended periods of time at USDOT agencies to conduct specialized research or studies.
- Provide opportunities for USDOT, other public sector and industry staff to study and/or perform research at the *ATLAS* Center through IPA like agreements.

1.3 Program Description

The overall thrust, that is, where it is envisioned that *ATLAS* will establish its niche areas, is on the application of ITS and modern computational and communication technologies in the development of algorithms, software, and systems in (1) advanced traffic management, and (2) advanced logistics management.

1.3.1 Technical Thrusts

In the first area, <u>advanced traffic management</u>, *ATLAS* will study, and develop appropriate algorithms, software and systems in, for example,

1. traffic-adaptive signal control,
2. traffic-adaptive ramp-metering,
3. speed control and route advisories through variable message signing,
4. demand management through congestion pricing,
5. real-time dynamic network load prediction and control,
6. incident detection and management,
7. region-wide dynamic traffic management,
8. simulation modeling for traffic management, and
9. decision-support systems for traffic management.

The majority of the research funding from the USDOT will be in on projects related to above topics.

Research in the second area, <u>advanced logistics management</u>, will include the study and the development of appropriate algorithms, software and systems in, for example,

1. scheduling of resources (trucks, cranes, containers, warehouses, etc.) for intermodal facilities,
2. electronic clearance at border crossings,
3. methods for routing and scheduling of carriers (trucks, cargo ships, airplanes, etc.),
4. simulation modeling for logistics management,
5. decision support systems for designing distribution networks, and
6. global distribution of goods, with consideration of world-wide shipping and supply-chain management.

1.3.2 Management and Staffing

A Center Director will manage administrative functions of the Center. The Director will be assisted by an Assistant Director and a team of staff members including an administrative assistant, a secretary, and a software engineer. Research and educational functions will be the responsibility of teams of faculty members and students. When possible and necessary, visiting faculty and researchers will also be involved in research and teaching. To draw upon the best available expertise in the thrust areas of the Center, it should be noted that faculty members associated with *ATLAS* would include faculty at the University of Arizona as well as elsewhere in the nation.

In view of the fact that the scope of the Center is national and international, it is anticipated that the Center will develop memoranda of agreement to enable collaborations with national and international experts. This will enable faculty associated with the Center to collaborate with faculty from other universities and research organizations, as well as work on joint projects sponsored by firms and agencies (in US and elsewhere). These "external" faculty members will be designated as *Affiliated Members* of the *ATLAS* Center. Table I lists the current faculty members associated

with the Center, including external affiliated members who have expressed an interest in collaborations with the Center.

ATLAS will have a unique way to assure that its research/educational activities are both innovative and relevant. Each research/educational project selected will require that the principal investigator associated with the project (hereinafter referred to as the Principal Associate Investigator, PAI) (1) clearly delineates the expected contributions when the project is completed, (2) identifies a champion in an agency or a firm that will find these contributions highly useful, and (3) deliver a report which includes results that either have scholarly archival value (e.g., result in major publications) or are useful for advanced education (e.g., through courses and workshops). A PAI will be responsible for working closely with the agency/firm that champions his/her project and for the success of the project.

The Center will conduct two types of research projects (1) basic research and (2) applied research. A basic research project will typically involve a single PAI and a graduate student, and the expected results would be publishable algorithms or methods that may be used in traffic or logistics management systems. Cost sharing from the PAI's department would be expected, and some type of support (funding or in-kind) from the champion would be preferred. Typical funding, excluding cost sharing, for a basic research project will be $55K.

Applied research projects would typically involve PAI(s) working with other investigators and one or two graduate students. Its expected deliverable would be both a publishable result, and software or a system that may be submitted to an agency/firm for further evaluation (e.g. field testing). Cost sharing from the PAI's department and the agency/firm championing the project will be expected. Typical funding for an applied research project, excluding cost sharing, will be $100K.

Center educational projects include (1) course development, (2) curriculum development, (3) instructional lab development, and (4) workshops/conferences. Funding of the educational projects will depend on the scope of the projects, but it is envisioned that course development will require only faculty time (average funding $15K), workshops will include faculty and administrative support (average funding $25K), and instructional lab development will include faculty and student support and equipment (average funding $70K). In addition, a limited number of scholarships will be awarded for practicing engineers and managers to attend workshops/conferences and short courses provided by the Center.

A. Administrative Organization

With faculty PAI's responsibilities on specific research/educational projects being well defined, the administrative structure for *ATLAS* will be minimal requiring only one Center Director (with 50% of his/her salary, for administration, coming from the Center's budget), a full-time Assistant Director, and an administrative assistant. A Technical Council (consisting of key researchers associated with the Center) will assist the Center Director in defining future directions of the Center, building industrial and governmental partnerships, and seeking resources and support from external agencies and firms. The Center Director and the Technical Council will evaluate each project for potential funding, and will facilitate each selected PAI to complete the project's objectives.

The Center Director and the Technical Council will be advised by an Administrative Board and an External Advisory Committee (eventually there will be two subcommittees, one for Advanced Traffic Management, and the other for Advanced Logistics Management). The Administrative Board comprised of the Vice President of Research, Dean of Engineering and Mines, a representative for USDOT, a representative for ADOT, and selected academic department heads will advise the Center Director on matters related to the financial, personnel and policy-related issues.

The External Advisory Committee (EAC) will advise the Center Director and the Technical Council on assessment of future research/educational needs, and on the review of the Center's projects. The membership of EAC will include experts and managers from agencies/firms who are visionary and extremely knowledgeable of the needs for better traffic and logistic management.

EAC will meet twice per year to review the *ATLAS'* ongoing research, technology transfer, and human resource development and diversity activities and advise *ATLAS* during preparation of the annual program plan. During its first meeting, the EAC will develop, within the general guidelines detailed herein, an organizational and operating structure for performing these functions.

EAC will also provide feedback on the draft annual plan submitted every April for the subsequent fiscal year beginning August 1st. (It should be noted that the Annual Plan for the first year of operation August 1998 - July 1999 is given in Part II of this proposal and is expected to be in finalized before August 1998. It will not follow the process discussed below which will be implemented for subsequent Annual Plans.)
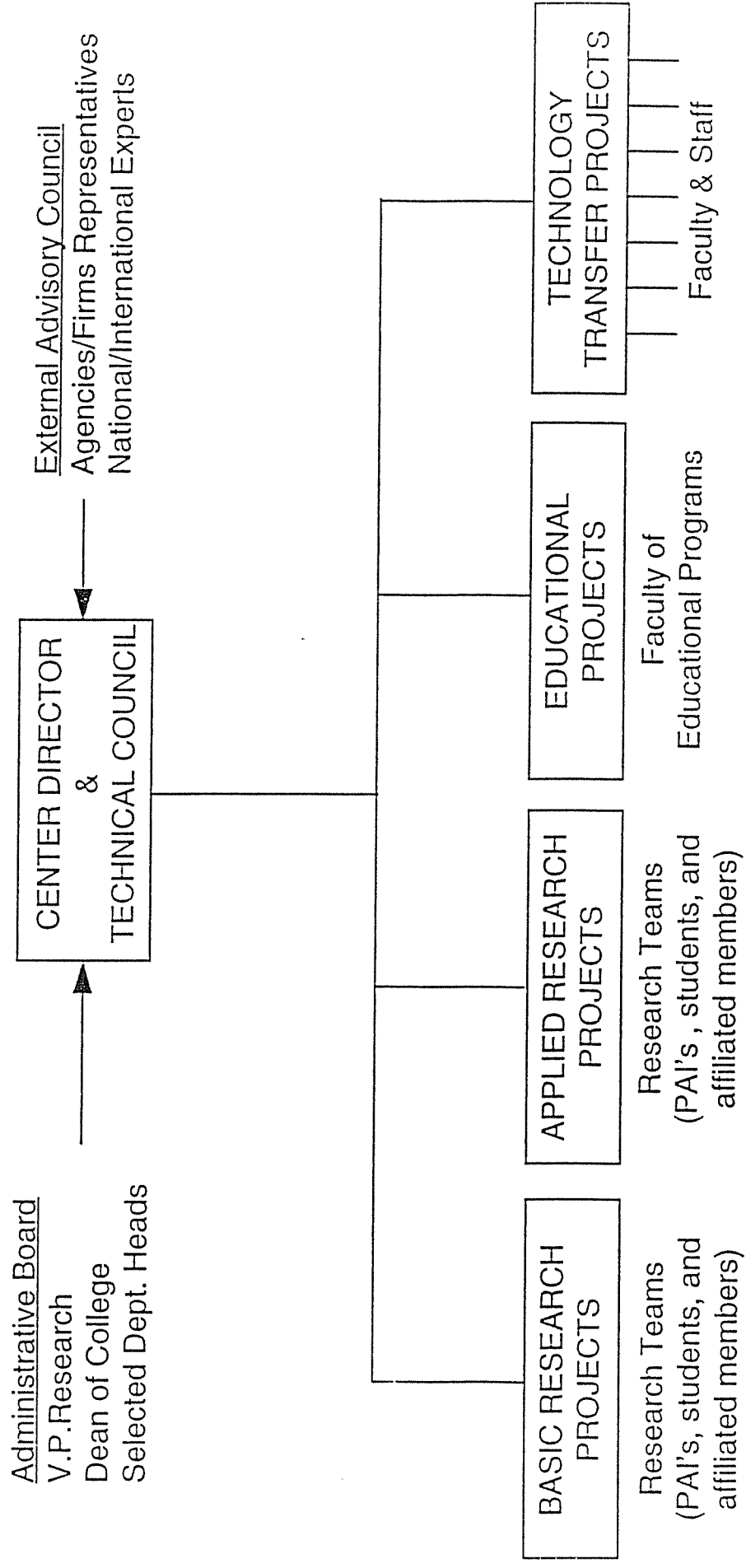
The schedule for the Annual Program Planning Process for *ATLAS-ITS* Program is as follows:

- On or before April 15 of each year, *ATLAS* will draft an Annual Program Plan in consultation with the agencies/firms providing research/education funds and will distribute the draft Annual Program Plan to the Administrative Board and the External Advisory Committee for review. (The Center Director will attend the ITS RCE Center Directors' Annual Meeting with the AOTR, and meet with the other center directors and DOT staff at TFHRC (or other mutually convenient site) to obtain input on DOT research and education activities and needs, prior to preparation of the draft Annual Plan.)

- On or before June 1 of each year, a joint meeting of the Administrative Board and the External Advisory Committee will be convened to advise *ATLAS* on the draft Annual Program Plan.

- On or before June 15 of each year, *ATLAS* will submit a revised draft Annual Program Plan to the AOTR.

- On or before June 30 of each year, the Government will review the Annual Program Plan submission and the Agreement Officer will either request revisions or approve the plan.

- On or before July 15 of each year, if required, *ATLAS* will submit a revised Annual Program Plan that reflects the Agreement Officer's review comments.

- As soon as practicable after receipt of a revised annual plan that is acceptable to the Agreement Officer, the Agreement Officer will approve that revised annual plan and authorize the Center Director to proceed.

After the annual program plan is approved by the funding organizations, and *ATLAS* is authorized to proceed with implementing the program, the Center Director will prepare and distribute to the EAC an overview of the approved program.

The organization chart for the *ATLAS* Center is shown in Exhibit 1.

Exhibit 1: ATLAS Organizational Chart

Administrative Board
V.P.Research
Dean of College
Selected Dept. Heads

CENTER DIRECTOR
&
TECHNICAL COUNCIL

External Advisory Council
Agencies/Firms Representatives
National/International Experts

BASIC RESEARCH PROJECTS

Research Teams
(PAI's, students, and affiliated members)

APPLIED RESEARCH PROJECTS

Research Teams
(PAI's, students, and affiliated members)

EDUCATIONAL PROJECTS

Faculty of
Educational Programs

TECHNOLOGY TRANSFER PROJECTS

Faculty & Staff

B. Physical Facilities, Equipment and Library Resources

ATLAS activities at the UA will be primarily housed in its Systems and Industrial Engineering (SIE) Department, although individual research activities will be conducted throughout the campus at many locations, as well as in "home" departments of affiliated members. Within the SIE Department, there is now the *RHODES* laboratory and the *Living Laboratory for Transportation Technologies*. With capital funds provided by the Vice President of Research and the Dean of the College of Engineering and Mines, some SIE facilities will be renovated to have a designated physical location for *ATLAS* which will include these and other laboratories and offices for faculty and staff associated with the Center.

Equipment needs for the Center are not substantial; requirements are only additional computational and related equipment. Support provided by the USDOT, the City of Tucson, the College, and the SIE Department will cover those funding requirements (and will used towards the mandated cost sharing required by the USDOT). Current library resources are considered adequate to support the Center activities.

I.3.3 Development and Long-term Budget Plans

The financial support for the *ATLAS* will come, for the most part, from outside funds. Reallocation of faculty time and filling of faculty lines will be made with the Center's research focus and the 20% cost-sharing requirement in mind.

The primary source of support for *ATLAS* will come from USDOT, administered through the Arizona Department of Transportation. In addition, there will be two other categories of external funding; contract funding and corporate/agency memberships. Currently, there is a significant support, through contracts, from the Federal Highway Administration, the Arizona Department of Transportation and the City of Tucson for real-time control of traffic; this support and other anticipated contracts from agencies and firms will come under the auspices of the Center.

The second category, corporate/agency memberships, will enable firms and agencies to "join" the Center for a nominal fee so that they may participate in workshops and have access to reports and publications. Also, it will allow faculty and students access into the operations of member firms/agencies so that they may direct their research on relevant traffic and logistics management issues that will have far-ranging impacts.

In the first year, the Center Director will expend significant effort towards the development of the long-term vision and support for the Center. In particular, he will organize three workshops (or symposiums) inviting well-known researchers and practitioners to identify new research opportunities that not only will enhance the professional and academic state-of-the-art but also be highly relevant, beneficial and provide more "bang for the buck" from the successful conduct of the identified research.

The Center Director will seek support from agencies/firms who should find the research identified as being very beneficial. In particular, in the traffic management area, he will seek support, partnership and/or collaboration from USDOT, state DOTs, and various traffic departments, in US and elsewhere in the world. In the logistics management area, the Center Director will seek support, partnership and/or collaboration from trucking companies, railroads, seaport and airport operators, delivery services, multi-national companies interested in global logistics, and shipping companies and airlines.

When this proposal is funded, it is anticipated that the first year support in the *ATLAS* Center will include (1) the $1 Million from USDOT/FHWA/ADOT for the establishment of the *ATLAS-ITS* Program (the funding for this proposal), (2) $100,000 from ADOT for field test of a recently

developed real-time traffic-adaptive ramp-metering strategy, (3) $100,000 from PB Farradyne Inc. for the field testing of *RHODES* in Seattle, Washington, and (4) $150,000 from the City of Tucson (in addition to the continuing support from FHWA and the City of Tucson) for the Field testing of *RHODES* in Tucson.

For funding the Center in subsequent years, the Center Director will submit proposals to FHWA/USDOT for a continuing support of $1 Million per year. In addition, it is anticipated other traffic agencies/firms, and private and public firms/agencies interested in advanced logistics management will provide funding in the logistics management area totaling another $1 Million per year. Given this level of support over the next five years, it is envisioned that *ATLAS* will be a global Center of Excellence in research and education related to advanced traffic management and advanced logistics management. Researchers, students, agencies, and private firms interested in research and/or education and/or technology transfer in these areas will seek to join or collaborate in the activities of the Center.

PART II

First-year Annual Plan for ATLAS-ITS Program

2.1 Program Overview

Two major factors in the economic competitiveness of a country and the quality of life of its people are (1) the mobility of people to move easily between home and workplace and other destinations, minimizing the attendant impact on clean air, and (2) the efficient movement of goods from point of origin to points of destinations. Thus, economic competitiveness and people's quality of life can be enhanced considerably by better management of vehicular traffic on the road network through advances in, for example, traffic-adaptive signal control and ramp-metering, demand management through congestion pricing, and real-time dynamic network load control. This we refer to as Advanced Traffic Management.

Economic competitiveness can also be enhanced by better management of logistics dealing with the movement of goods through advances in, for example, scheduling of resources (trucks, cranes, containers, warehouses, etc.) for intermodal facilities, electronic clearance at border crossings, methods for routing and scheduling of carriers (trucks, cargo ships, airplanes, etc.), decision support systems for designing distribution networks and making better logistics decisions by carriers. Included in Advanced Logistic Management issues is the global distribution of manufactured goods, where consideration of world-wide shipping and supply-chain management can improve the efficiency and cost of goods movement.

It is envisioned that, within the next five years, The Center for Advanced Traffic and Logistics Algorithms and Software (*ATLAS*) at the University of Arizona will be an internationally and nationally recognized resource for excellence in research and learning of technologies, algorithms and systems for efficient and effective traffic and logistics management. Public agencies and private firms will seek out *ATLAS* for assistance in assessing research needs and conducting research and development projects. *ATLAS* will be a continuing source of talented researchers and graduates who are engaged in researching, developing and deploying the state-of-the-art traffic and logistics management systems.

Mission Statement

1. ATLAS will conduct basic and applied research on technologies (including communication and computer technologies) and methods (including algorithms and software) for traffic and logistics management, with the goal to make the implementation of systems for this purpose effective, efficient, and economical.

2. ATLAS will enhance, through course and curricular development, the current traffic and logistics related teaching activities at UA; it will provide the education that relates to the understanding of technologies, methods and systems, and their implementation, for traffic engineers, logistics managers/planners, transportation practitioners, shippers, cargo carriers, system operators and other related decision makers.

3. ATLAS will assist in the effective transfer of Intelligent Transportation Systems and other computer/communication technologies, and traffic and logistics management software, to the transportation industry(including roads, ports, and border crossings operators), private companies and public agencies, through seminars, short courses and participation in operational tests and demonstration projects

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Based on the vision and mission of the *ATLAS* Center, the Programmatic Goals of the *ATLAS-ITS* Program are the following.

* Devise and implement an objective process for selecting and reviewing research based on the *ATLAS* mission and USDOT strategic national objectives.
* Build research and educational partnerships with the private sector, federal state and local government agencies (outside of USDOT), and/or other academic institutions.
* Incorporate and balance innovative, long-range high-risk ITS research projects with short term applied research activities (like short- and long-term operational needs, institutional issues, or demonstration tests).
* Emphasize modal, intermodal and multimodal surface transportation issues consistent with the Strategic Plans of the USDOT modal agencies and their annual research needs.
* Assist in the development of means to integrate various technologies including systems architecture, transportation systems analysis, modeling and simulation, databases and databases management, communications, safety and human factors, and software design and development.
* Allow for changes and assignment of different activities to the Center as part of the annual program plan process.

The Professional Capacity Building, Educational and Technology Transfer Goals of the *ATLAS-ITS* Program are to:

* Assist in the advancement of skills of today's state and local transportation agencies to operate and maintain various traffic and logistics management & control systems (Professional Capacity Building).
* Assist in the effective transfer of ITS and other computer/communication technologies, and traffic and logistics management software, to transportation agencies, industries and companies.
* Actively cooperate with the UTC and Council of University Centers schools to transfer ITS research into curriculum development.
* Attract and retain highly qualified faculty members, researchers, and students who are, or are expected to become, recognized experts in advanced traffic and logistics management algorithms and systems, and who reflect the growing diversity of the U.S. work force.
* Provide opportunities for visiting industry, academic & government representatives to have work experiences in technologies and methods developed at the *ATLAS* Center.
* Provide opportunities for faculty, staff and students to spend extended periods of time at USDOT agencies to conduct specialized research or studies.
* Provide opportunities for USDOT, other public sector and industry staff to study and/or perform research at the *ATLAS* Center through IPA like agreements.

2.2 Program Description

The overall thrust is on the application of ITS and modern computational and communication technologies in the development of algorithms, software, and systems in (1) advanced traffic management, and (2) advanced logistics management.

In the first area, advanced traffic management, *ATLAS* will study, and develop appropriate algorithms, software and systems in, for example.

1. traffic-adaptive signal control,
2. traffic-adaptive ramp-metering,
3. speed control and route advisories through variable message signing.
4. demand management through congestion pricing,
5. real-time dynamic network load prediction and control.
6. incident detection and management,
7. region-wide dynamic traffic management.
8. simulation modeling for traffic management. and
9. decision-support systems for traffic management.

Research in the second area, advanced logistics management, will include the study and the development of appropriate algorithms, software and systems in, for example,

1. scheduling of resources (trucks, cranes, containers, warehouses, etc.) for intermodal facilities,
2. electronic clearance at border crossings,
3. methods for routing and scheduling of carriers (trucks, cargo ships, airplanes, etc.),
4. simulation modeling for logistics management,
5. decision support systems for designing distribution networks, and
6. global distribution of goods, with consideration of world-wide shipping and supply-chain management.

Below are listed some projects that will be initiated in the first year. Additional projects will be identified. scoped and initiated after the workshops (Projects 1 and 2) that will be held during the months of July 1998 - October 1998. The statement of work for these projects will be developed in October 1998 and submitted to the external advisory committee for review in November 1998. The projects and their statement of work will be revised, if required, and submitted to AOTR for approval. It is anticipated that the additional projects will be initiated in January 1999.

2.2.1 Project 1: Workshop on Advanced Traffic Management

Experts from Arizona and elsewhere, academic and practitioners, will be invited to participate in a 2-day workshop to evaluate current state of art and practice in advanced traffic management, and to identify research areas with large potential benefits. For each research area identified, possible research projects will be scoped. the potential of getting implementable results will be identified (i.e., projects will be classified high risk vs. low risk) and the required effort for each project will be estimated.

PAI: Faculty Team from UA   Project's Direct Costs: $25,000

2.2.2 Project 2: Workshop on Advanced Logistics Management

Experts from Arizona and elsewhere, academic and practitioners, will be invited to participate in a 2-day workshop to evaluate current state of art and practice in advanced logistics management. and to identify research areas with large potential benefits. For each research area identified, possible research projects will be scoped, the potential of getting implementable results will be identified (i.e., projects will be classified high risk vs. low risk) and the required effort for each project will be estimated.

PAI: Faculty Team from UA   Project's Direct Costs: $25,000

2.2.3 Project 3: Real-Time Network Coordination

Good real-time traffic-adaptive control schemes, such as *RHODES*, do well for (1) an intersection, (2) a diamond interchange, and (3) few intersections of an arterial. The project will study and test real-time control for a grid subnetwork that includes 9-16 intersections. Potential benefits of the project include (1) improved traffic control in a grid (very prevalent in Arizona) and (b) further enhance *RHODES* system for real-time traffic adaptive control.

PAI: Pitu Mirchandani [1]   Project's Direct Costs: $100,000

2.2.4 Project 4: Graphical User Interface for Network Modeling

The process of developing network models, be they for developing transportation plans, for designing traffic operations, for implementing a traffic control system, or for testing new network-based algorithms is tedious and time-consuming. This project will design a software system with effective graphical user interface for developing a network model from a map. The map may be the conventional paper document (e.g., from an atlas) or may be available in a coded data base. The project will develop a requirements document and develop a preliminary software prototype.

PAI: Suvrajeet Sen   Project's Direct Costs: $55,000

2.2.5 Project 5: Management of Over-Saturated Congestion

Most passive and/or proactive control strategies seem to keep traffic "under control" at moderate congestion levels. However, for extended period of high congestion, network may have significant queue spillback and grid lock. Current status of traffic control in oversaturated conditions is quite rudimentary. The project will address real-time queue management approaches for oversaturated conditions. Potential benefits of the project: it will provide an approach to alleviate congestion in areas where there is significant queue spillback or gridlock.

PAI: Pitu Mirchandani   Project's Direct Costs: $55,000

2.2.6 Project 6: Estimation and Prediction of Network-wide Travel Times.

Currently, there is little useful research available on the approximate prediction of network-wide travel times. The project will study current state-of-the art/practice and develop travel time estimation/prediction methods. Travel time predictions will assist pre-trip decision making for travelers and for broadcasting expected travel times to traveler information systems. Furthermore, this will contribute to real-time traffic adaptive control since the highest level of the *RHODES* hierarchical control structure calls for dynamic network load control (through variable message signs).

PAI: Pitu Mirchandani   Project's Direct Costs: $55,000

2.2.7 Project 7: Fuzzy Logic Variable Speed Limit Device.

The project will develop field hardware units for testing fuzzy logic based variable speed limits along the I-40 Corridor in Arizona. The fuzzy logic system will be interfaced with RWIS stations and variable speed limit signing. System performance will be field evaluated under varying conditions. It is anticipated that safety and traffic conditions will be improved with this device.

PAI: John Placer   Project's Direct Costs: $100,000

2.2.8 Project 8: Emergency Pathways for *RHODES*.

When an emergency vehicle (e.g.. ambulance or a fire engine) leaves for an incident. one knows its origin and its destination. If the travel times in the network are known (see Project 6). the *RHODES* architecture allows the traffic control system to suggest a fast route and open a pathway from the origin to the destination along this route -- with least disruption on other network traffic. The project will develop a strategy that may be implementable on the *RHODES* system and conduct a simulation-based study. The potential benefit of a successful strategy is enormous - it could decrease emergency vehicle related traffic disruptions and, more importantly, increase the probability of saving lives and reducing property damage.

PAI: Pitu Mirchandani   Project's Direct Costs: $55,000

2.2.9 Project 9: Simulation Modeling of Intermodal Transfer Facilities

This project will develop a user-friendly event-based simulation model of intermodal transfer facilities, much in the way CORSIM is for simulation vehicular traffic. If a design of a facilities and its logistics operations are to be studied, this model will be able to obtain measures of effectiveness (such as transfer delays, work-in-process, utilization of material handling units, etc.) in a relatively straight forward manner. This will be an extremely useful research tool for evaluating logistics strategies and algorithms.

PAI: Frank Ciarallo   Project's Direct Costs: $55,000

2.2.10 Project 10: Workshop On The Interactions Between Air/Rail/Sea Traffic Management and Goods Movement

Experts from Arizona and elsewhere, academic and practitioners, will be invited to participate in a 2-day workshop to evaluate the interactions between air/rail/sea traffic management and goods movement, and to identify research areas with large potential benefits. For each research area identified, possible research projects will be scoped, the potential of getting implementable results will be identified (i.e., projects will be classified high risk vs. low risk) and the required effort for each project will be estimated.

PAI: Faculty Team from UA   Project's Direct Costs: $25,000

2.3 Management Approach

A Center Director will manage administrative functions of the Center. The Director will be assisted by an Assistant Director and a team of staff members including an administrative assistant, a secretary, and a software engineer. Research and educational functions will be the responsibility of teams of faculty members and students. To draw upon the best available expertise in the thrust areas of the Center, faculty members associated with *ATLAS* would include faculty at the University of Arizona as well as elsewhere in the nation designated as *Affiliated Members* of the Center. Table 2 lists the current faculty members associated with the Center, including external affiliated members who have expressed an interest in collaborations with the Center.

Dr. Pitu Mirchandani will be the Director of the Center. He has demonstrated leadership and has extensive experience in building consortia and partnerships. He comes with the right experience in program management and systems engineering, and has documented qualifications and scientific accomplishments that are necessary for the development of a successful research center. Dr. Mirchandani's management experience, technical expertise, and his hands-on approach is most appropriate for the management of a research center. A brief biosketch is given below.

Dr. Pitu B. Mirchandani

Dr. Mirchandani is a Professor of Systems & Industrial Engineering and Electrical & Computer Engineering at the University of Arizona.

Dr. Mirchandani's educational background includes Bachelors and Masters degrees from UCLA in Electrical Engineering and Control Systems respectively, a S.M. degree from MIT in Aeronautics and Astronautics, and a Sc.D. degree, also from MIT, in Operations Research. He was previously a Professor of Electrical, Computer & Systems Engineering and Decision Sciences at Rensselaer Polytechnic Institute, New York. Over the last several years he has attended numerous workshops in the ITS and related areas and has received a National Highway Institute's Certificate of Training in ITS Planning and Functional Requirements.

Dr. Mirchandani has extensive experience in organizational development, (1) having been the major architect in the design of the Decision Sciences and Engineering Systems Department at Rensselaer Polytechnic Institute, (2) having helped in the formation of the Regional II University Transportation Center, (3) having developed consortia to respond to major FHWA Requests for Proposal in ITS areas, and (4) having been the Department Head of the Systems and Industrial Engineering Department at the University of Arizona.

Dr. Mirchandani areas of technical expertise include systems modeling and design, scheduling, logistics, optimization, and real-time decision systems. His research interests have focused on the modeling of spatial and temporal interactions for the design and decision-making in spatially distributed systems. These include transportation systems, communication networks, production and service systems. Some past and current research efforts relevant to this proposal deal with state estimation with noisy measurements, routing in stochastic networks, generalized traffic equilibrium, hazardous materials transportation, real-time traffic control systems, and channel assignment in integrated cellular radio-telephone systems.

He has over 20 years of related experience, and has provided algorithms, design development and implementation expertise on numerous projects. His work has been supported by federal agencies such as NSF and USDOT and state agencies such as NYDOT, ADOT, and NYSERDA. Supported projects include the current *"An Open Systems Communication/Control Architecture for Real-Time Traffic Adaptive Signal Control"* from USDOT/FHWA, September 1997 - date, *"RHODES Projects on the Development of a Real-Time Traffic Adaptive Signal Control Prototype "*, from USDOT/FHWA and the Arizona Department of Transportation (1992 - date) through their Intelligent transportation Systems (ITS) programs; and past project on *"Logistics for Hazardous Materials Transportation: Scheduling, Routing, and Siting,"* funded by NYS-NJ-USDOT Transportation Research Consortium, (1989 - 1991).

He has also been supported by private companies such as GM, Hughes (where he was a team member of the *ITS Architecture Project*), Alcoa, GE, Kodak, NYNEX, USWest, and AT&T.

Dr. Mirchandani has over 70 publications in refereed journals and proceedings and two books including *Location on Networks; Theory and Algorithms* (MIT Press, 1979) and *Discrete Location Theory* (John-Wiley, 1990). He is a member of IEEE, INFORMS, IIE, ACM, TRB, ITS America and a charter member of ITS-Arizona.

ATLAS will have a unique way to assure that its research/educational activities are both innovative and relevant. Each research/educational project funded will require that the Principal Associate Investigator, PAI) of the project (hereinafter referred to as (1) clearly delineates the expected contributions when the project is completed, (2) identifies a champion in an agency or a firm that will find these contributions highly useful, and (3) deliver a report which includes results that either have scholarly archival value (e.g., result in major publications) or are useful for advanced education (e.g., through courses and workshops). A PAI will be responsible for working closely with the agency/firm that champions his/her project and for the success of the project.

With faculty PAI's responsibilities on specific research/educational projects being well defined, the administrative structure for *ATLAS* will be minimal requiring only one Center Director (with 50% of his/her salary, for administration, coming from the Center's budget), a full-time Assistant Director, and an administrative assistant. A Technical Council (consisting of key researchers associated with the Center) will assist the Center Director in defining future directions of the Center, building industrial and governmental partnerships, and seeking resources and support from external agencies and firms. The Center Director and the Technical Council will evaluate each project for potential funding, and will facilitate each PAI to complete the project's objectives.

The Center Director and the Technical Council will be advised by an Administrative Board and an External Advisory Committee. The Administrative Board comprised of the Vice President of Research, Dean of Engineering and Mines, a representative for USDOT, a representative for ADOT, and selected academic department heads will advise the Center Director on matters related to the financial, personnel and policy-related issues.

The External Advisory Committee (EAC) will advise the Center Director and the Technical Council on assessment of future research/educational needs, and on the review of the Center's projects. The membership of EAC will include experts and managers from agencies/firms who are visionary and extremely knowledgeable of the needs for better traffic and logistic management.

EAC will meet twice per year to review the *ATLAS*' ongoing research, technology transfer, and human resource development and diversity activities and advise *ATLAS* during preparation of the annual program plan. During its first meeting, the EAC will develop an organizational and operating structure for performing these functions. EAC will also provide feedback on the draft annual plan submitted every April for the subsequent fiscal year beginning August 1st.

The schedule for the Annual Program Planning Process for *ATLAS-ITS* Program is as follows:

- On or before April 15 of each year, *ATLAS* will draft an Annual Program Plan in consultation with the agencies/firms providing research/education funds and will distribute the draft Annual Program Plan to the Administrative Board and the External Advisory Committee for review. (The Center Director will attend the ITS RCE Center Directors' Annual Meeting with the AOTR, and meet with the other center directors and DOT staff at TFHRC (or other mutually convenient site) to obtain input on DOT research and education activities and needs, prior to preparation of the draft Annual Plan.)

- On or before June 1 of each year, a joint meeting of the Administrative Board and the External Advisory Committee will be convened to advise *ATLAS* on the draft Annual Program Plan.

- On or before June 15 of each year, *ATLAS* will submit a revised draft Annual Program Plan to the AOTR.

- On or before June 30 of each year, the Government will review the Annual Program Plan submission and the Agreement Officer will either request revisions or approve the plan.

- On or before July 15 of each year, if required, *ATLAS* will submit a revised Annual Program Plan that reflects the Agreement Officer's review comments.

- As soon as practicable after receipt of a revised annual plan that is acceptable to the Agreement Officer, the Agreement Officer will approve that revised annual plan and authorize the Center Director to proceed.

After the annual program plan is approved by the funding organizations, and *ATLAS* is authorized to proceed with implementing the program, the Center Director will prepare and distribute to the EAC an overview of the approved program.

The organization chart for the *ATLAS* Center is shown in Exhibit 2.

2.4 Physical Facilities, Equipment and Library Resources

The resources provided by the University of Arizona (UA) include space, equipment, funding and **people (faculty and students).**
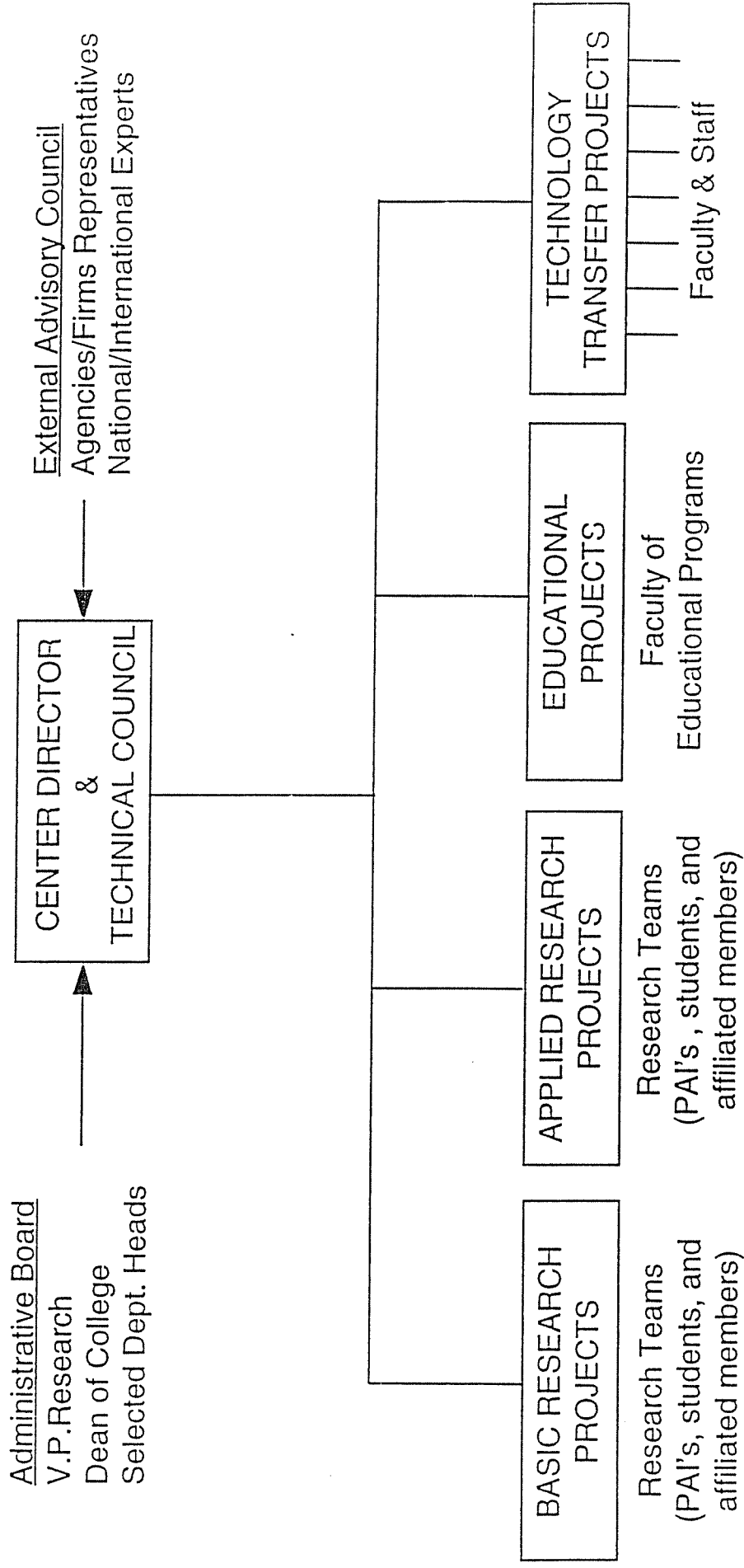
ATLAS activities at the UA will be primarily housed in its Systems and Industrial Engineering (SIE) Department, although individual research activities will be conducted throughout the campus at many locations, as well as in "home" departments of affiliated members. With capital funds provided by the Vice President of Research and the Dean of the College of Engineering and Mines, some SIE facilities will be renovated to have a designated physical location for *ATLAS* which will include these and other laboratories and offices for faculty and staff associated with the Center.

UA also provides laboratory space and equipment to many of the faculty associated with the Center. Except for collecting some indirect costs, UA will allow *ATLAS* faculty to use their equipment and laboratories for Center R&D activities. Currently the laboratories available to the *ATLAS* faculty are:

- Traffic Systems (RHODES) Laboratory

- Living Laboratory for Transportation Technologies.

- Robotics and Automation Laboratory

- Laboratory for Algorithmic Research

- AI/Simulation Laboratory

Equipment needs for the Center are not substantial; requirements are only additional computational and relat d equipment. Support provided by the USDOT, the City of Tucson, the College, and the SIE Department will cover those funding requirements (and will used towards the mandated cost sharing required by the USDOT). Current library resources are considered adequate to support the Center activities.

Exhibit 2: ATLAS Organizational Chart

Administrative Board
V.P.Research
Dean of College
Selected Dept. Heads

External Advisory Council
Agencies/Firms Representatives
National/International Experts

CENTER DIRECTOR
&
TECHNICAL COUNCIL

BASIC RESEARCH
PROJECTS

Research Teams
(PAI's, students, and
affiliated members)

APPLIED RESEARCH
PROJECTS

Research Teams
(PAI's , students, and
affiliated members)

EDUCATIONAL
PROJECTS

Faculty of
Educational Programs

TECHNOLOGY
TRANSFER PROJECTS

Faculty & Staff

The research faculty at UA, specifically in the College of Engineering and Mines, usually teach four courses a year, which consumes about half of their "40-hour" week. In the remaining time they are expected to conduct research and perform service to the university, community, and their professions. It will be expected that UA will cost share some of *ATLAS* faculty's 40-hour week to the projects within the Center. In conjunction with this release time, a faculty member may "buy" additional release time through project funding and thereby be released from a course so that he/she may devote more time to his/her project. Exhibit 3 gives a typical budget for a basic research project involving one faculty member, one graduate student, and some effort of another researcher (faculty or Center personnel). Please note the $10,000 cost-share by the University. Total support by the University through faculty release time is $90,000. In addition, UA's Vice-President of Research and the College of Engineering and Mines will provide $160,000 for part of the Center Director's salary, research assistantships and equipment.

2.5 Human Resources and Diversity

The University of Arizona is well known for human and cultural diversity. Partly because of its unique location in the Southwest, and partly because it is a state supported university its "citizen customers" include significant populations of Native Americans, Hispanics, African Americans, currently underrepresented in the transportation community.

ATLAS will attempt to recruit underrepresented groups into the transportation/ITS community. The mechanism available to it include (1) graduate fellowships, (2) community college partnerships, and (3) hiring within the Center. As it is done elsewhere at UA, graduate fellowships will be targeted to promising new students from non-traditional engineering fields and from underrepresented groups who wish to go into the transportation/ITS profession.

Finally, faculty, researchers, and staff will be hired into the Center when it is funded. The University of Arizona is an Affirmative Action/Equal Opportunity employer. Announcements for positions within the university indicate this and the university has a stringent procedure for hiring to assure that affirmative action procedures are followed. (Procedures will be made available upon request.) Through this mechanism we hope to attract faculty, researchers, and staff from underrepresented groups.

2.6 Budget Details

The primary source of support for first year of the *ATLAS-ITS* Program will come from USDOT, administered through the Arizona Department of Transportation. The University of Arizona has extensive experience in the financial management of large sponsored centers and programs. The Center Director is experienced in managing sponsored research and currently oversees over a million dollars of sponsored research as the Head of the Systems and Industrial Engineering Department. No financial management problems are anticipated in the administration of the Center

Corporate/agency memberships, when they become available, will enable firms and agencies to "join" the Center for a nominal fee so that they may participate in workshops and have access to reports and publications. Also, it will allow faculty and students access into the operations of member firms/agencies so that they may direct their research on relevant traffic and logistics management issues that will have far-ranging impacts. Each member contributing to the Center will receive financial reports on the Center, and detailed financial breakdowns on projects, if any, sponsored or cost-shared by the member.

Exhibit 4 shows the overall budget for the first year.

Exhibit 3
Typical Budget for a Basic Research Project

Typical Budget for an ATLAS-ITS Project			
	ADOT/FHWA	Cost-Share	Total
PAI			
25% AY	$7,500	$7,500	
1 month summer	$6,667		
Other Investigators	$3,000	$0	
Subtotal	$17,167	$7,500	
Graduate Assistant	$21,800	$0	
(50% AY + 2 mo.summer)			
Admin. Assist./ Sec.	$500	$0	
Total Direct Labor	$39,467	$7,500	
ERE			
Investigators(19.2%)	$3,300	$1,440	
Students(3.4%)	$740	$0	
Staff(22.7%)	$110	$0	
Subtotal ERE	$4,150	$1,440	
Operations	$1,000	$0	
Travel	$1,500	$0	
Total Direct	$46,117	$8,940	$55,057
Indirect (15%)	$6,920	$1,340	
Grand Total	$53,037	$10,280	$63,317

Exhibit 4
Overall Budget for the ATLAS-ITS Program

EXPENDITURE ITEMS	UA*	FHWA/ADOT
Administration		
Director (faculty)	36,000	72,000
Assistant Director/Research Associate		75,000
Administrative Assistant		35,000
Graduate Assistants	24,000	23,000
Travel		15,000
Operations		20,000
Projects		
PAI (Faculty)	90,000	150,000
Secretarial		15,000
Research Assistants		230,000
Travel		15,000
Operations		15,000
Workshops (3)		75,000
Scholarships		30,000
Institutional Overhead	22,500	130,000
One-time Expenditures		
Renovation	50,000	
Start-up Equipment	50,000	100,000
TOTALS	272,500	1,000,000

Footnote
*Cost-sharing by UA will be by allocation of director and faculty time to ATLAS activities, continuing expenditure for a graduate assistant from VP Research and College, and one-time expenditure for renovations and expenditures for equipment.

When this proposal is funded, it is anticipated that the first year support in the *ATLAS* Center will include (1) the $ 1 Million from USDOT/FHWA/ADOT for the establishment of the *ATLAS-ITS* Program (the funding for this proposal), (2) $100,000 from ADOT for field test of a recently developed real-time traffic-adaptive ramp-metering strategy. (3) $100,000 from PB Farradyne Inc. for the field testing of *RHODES* in Seattle, Washington, and (4) $150,000 from the City of Tucson (in addition to the continuing support from FHWA and the City of Tucson) for the Field testing of *RHODES* in Tucson.

2.7 Report Dissemination

The *ATLAS-ITS* Program will establish a "Library and Reports Publication Office". All reports and papers produced within the Center will be put on a shelf and properly cataloged.

For each final technical report, one (1) magnetic medium in Adobe Acrobat Format with Distiller (PDF), one (1) unbound camera-ready original suitable for reproduction, and five (5) additional paper copies shall be sent to the FHWA. Mailing Address:

> ITS RCE Program
> ATTN: AOTR name
> Federal Highway Administration (HSR 10)
> U.S. Department of Transportation
> 6300 Georgetown Pike
> McLean, VA 22101

> ITS Joint Program Office
> Electronic Clearinghouse
> ATTN: Janice Sanders
> Federal Highway Administration (HVH-1)
> Room 3416
> 400 7th St. S.W.
> Washington, D.C. 20590

One paper copy and one copy to NTIS in Adobe Acrobat Format (PDF) which has been compressed with the "Acrobat Distiller" in computer readable format on 3 1/2 disk will be sent to the National Technical Information Service for inclusion in their information system. Mailing Address:

> U.S. Department of Commerce
> National Technical Information Service
> 5285 Port Royal Road
> Springfield VA. 22161

> Attention: Intake Department

Two (2) paper copies will be sent to each of the following four Transportation Research Information System (TRIS) depositories:

> Transportation Library
> Northwestern University Library
> Evanston, IL 60208

Institute of Transportation Studies Library
University of California, Berkeley
412 McLaughlin Hall
Berkeley, CA 94720

Transportation Research Board Library
2101 Constitution Avenue., N.W.
Washington, D.C. 20418

U. S. Dept. of Transportation
Library Services and Distribution Services
 Division
400 - 7th St.. S.W.
Washington, D.C. 20590

All technical reports, technical papers, conference presentations, and limited distribution reports, shall adhere to the guidelines provided by USDOT/FHWA. At the completion of the quarter in which the paper is presented/published three (3) copies of each such paper and one copy in electronic form (in Adobe Acrobat with Distiller) will be forwarded to the AOTR, with the quarterly or annual report. The electronic form will be on the same medium as the quarterly or annual report. Mailing address:

ITS RCE Program
ATTN: Technical Paper/Conference Pres.
Federal Highway Administration
U. S. Department of Transportation
Washington, DC 20590-0001

All technical reports and technical papers on the shelf in *ATLAS* library will be available for a nominal reproduction fee. Members of *ATLAS* will receive reports and papers produced within *ATLAS* at no charge to them.

ATLAS envisions that reciprocal arrangements will be made with each selected RCE whereby technical reports and journal papers would be shared between it and *ATLAS*. This will enable *ATLAS* researchers to keep abreast of the research at other RCEs. Reports and papers from other RCEs will also be stored on the shelf in the *ATLAS* library. It is anticipated that such reciprocal arrangements will be made with other research centers/institutes where significant ITS research is being conducted.

2.8 Supporting data

DRAFT
ITS Partnership Agreement
between
The Federal Highway Administration
and
Arizona Department of Transportation

Project No. ITS-9804(xxx)

The purpose of this agreement is to award a grant of Federal assistance to the State for specific Intelligent Transportation Systems (ITS) activities, and to maximize the involvement of the State and other project participants in the ITS program, as authorized by P.L. 102-240, Sections 6053(a), 6055(d), and 6056(a) (23 USC 307 note). The parties to this agreement are independent contracting parties, and nothing in this agreement shall be deemed to create a business partnership for purposes of sharing profits and losses.

1.   Estimated Cost.

The State shall be reimbursed for allowable costs incurred in the performance of work under this ITS Partnership Agreement in an amount not to exceed $1,000,000 in Federal ITS funds. This amount shall be matched at a minimum 80/20 (Federal/non-Federal) ratio, resulting in a matching share valued at not less than $250,000. Reimbursement for costs incurred will follow regular Federal-aid billing and payment procedures.

2.   Goals and Objectives.

The goals of this cooperative agreement is to establish a transportation research center at the University of Arizona. This center will be called the Advanced Traffic and Logistics Algorithms and Software (ATLAS) Center. The State shall work with the ATLAS Center to accomplish the following goals and objectives:

ATLAS Mission

The mission of the University of Arizona's ATLAS Center is to establish a global research center that conducts basic research on advanced technologies and methods for traffic and logistics management, aggressively develop algorithms and software for that purpose, assists in the implementation of this research, and enhance education and technology transfer activities that advance the state-of-the-practice in traffic and logistics management. In more detail, the mission of ATLAS is:

1.   ATLAS will conduct basic and applied research on technologies (including communication and computer technologies) and methods (including algorithms and software) for traffic and

1

logistics management, with the goal to make the implementation of systems for this purpose effective, efficient, and economical.

2.   ATLAS will enhance, through course and curricular development, the current traffic and logistics related teaching activities at University of Arizona; it will provide the education that relates to the understanding of technologies, methods and systems, and their implementation, for traffic engineers, logistics managers/planners, transportation practitioners, shippers, cargo carriers, system operators and other related decision makers.

3.   ATLAS will assist in the effective transfer of Intelligent Transportation Systems and other computer/communication technologies, and traffic and logistics management software, to the transportation industry(including roads, ports, and border crossings operators), private companies and public agencies, through seminars, short courses and participation in operational tests and demonstration projects

Programmatic Goals of the ATLAS-ITS Program

Based on the vision and mission of the ATLAS Center, the programmatic goals of the ATLAS-ITS Program are the following:

*   Devise and implement an objective process for selecting and reviewing research based on the ATLAS mission and U.S. DOT strategic national objectives.
*   Build research and educational partnerships with the private sector, federal, state and local government agencies, and/or other academic institutions.
*   Incorporate and balance innovative, long-range high-risk ITS research projects with short-term applied research activities (like short- and long-term operational needs, institutional issues, or demonstration tests).
*   Emphasize modal, intermodal and multimodal surface transportation issues consistent with the Strategic Plans of the U.S. DOT modal agencies and their annual research needs.
*   Assist in the development of means to integrate various technologies including systems architecture, transportation systems analysis, modeling and simulation, databases and databases management, communications, safety and human factors, and software design and development.
*   Allow for changes and assignment of different activities to the Center as part of the annual program plan process.

Professional Capacity Building, Educational and Technology Transfer Goals of the ATLAS-ITS Program

Professional capacity building, educational and technology transfer goals of the ATLAS-ITS Program are to:

- Assist in the advancement of skills of today's state and local transportation agencies to operate and maintain various traffic and logistics management & control systems (Professional Capacity Building).
- Assist in the effective transfer of ITS and other computer/communication technologies, and traffic and logistics management software, to transportation agencies, industries and companies.
- Actively cooperate with the UTC and Council of University Centers schools to transfer ITS research into curriculum development.
- Attract and retain highly qualified faculty members, researchers, and students who are, or are expected to become, recognized experts in advanced traffic and logistics management algorithms and systems, and who reflect the growing diversity of the U.S. work force.
- Provide opportunities for visiting industry, academic & government representatives to have work experiences in technologies and methods developed at the ATLAS Center.
- Provide opportunities for faculty, staff and students to spend extended periods of time at U.S. DOT agencies to conduct specialized research or studies.
- Provide opportunities for U.S. DOT, other public sector and industry staff to study and/or perform research at the ATLAS Center through IPA like agreements.

3. Responsibilities of the State.

In conformance with approved Work Orders (See Section 8 below), the State shall perform or cause to be performed the following:

a. Activities as described in the attached Annual Plan (See Section 5)
b. The reporting requirements outline in this cooperative agreement (See Sections 9-13)

4. Statement of Work.

In order to accomplish the objectives of the cooperative agreement, ATLAS shall, as a minimum, perform the following tasks:

Establish the ATLAS center which interacts closely with industry, State and local transportation agencies, and the U.S. DOT to fund and guide a program of research that engages faculty, staff and students from the universities, colleges, and institutes that the recipient represents.

ATLAS shall have three fundamental missions: research, human resource development and diversity, and technology transfer. The research program shall have two focus areas: traffic and logistics management issues. The technology transfer mission shall have four focus areas: technology transfer, development of training and curriculum materials, visiting industry and government representatives, and diversity.

ATLAS shall form an advisory committee to assist with the program direction. The Advisory committee should have representatives from major sectors of the ITS community, including:

international, national, regional, public sector and private sector. The FHWA shall be represented on any steering or management committees.

For each year that the cooperative agreement is in effect, ATLAS shall develop, distribute to an Advisory Committee for review, submit to FHWA for approval and implement an Annual Program Plan. Further details for the Annual Program Plan are described below.

5.   <u>Annual Program Plan.</u>

The State shall develop an overall Program Annual Plan, schedule, and budget including the minimum 20 percent non-Federal match requirement, for approval by the Federal Highway Administration (FHWA) Division. The Annual Plan, schedule, and budget shall become part of this signed agreement and attached as the last appendix, Appendix C.

The Annual Plan shall outline the activities of the ATLAS center and shall be organized into five sections:

- Program Overview - A brief introductory summary.
- Program Description - A detailed description of the specific objectives and actions items.
- Management Approach - A description of the organization arrangements and program controls to be instituted during the funding period to ensure administrative and technical responsiveness by the participants and to assure fiscal accountability.
- Budget Details - A consolidated budget reflecting projected program expenditures.
- Supporting Data - Additional information or explanatory material that is necessary to understand the ATLAS program plan.

The Center Director shall attend the ITS RCE Center Directors Annual Meeting to obtain input on U.S. DOT research and education activities and needs prior to preparation of the draft Annual Plan.

ATLAS shall draft an Annual Plan in consultation with the agencies providing matching funds and shall distribute the draft Annual Plan to the advisory committee for review. The center director shall meet with advisory board members from the State DOT and FHWA field office to gather input prior to preparation of the draft Annual Plan.

On or before May 15 of each year, a meeting of the Advisory Committee shall be convened to advise ATLAS on the draft Annual Plan. Based on Advisory Committee recommendations, ATLAS shall make revisions to the Annual Plan and shall submit a revised draft Annual Program Plan to the FHWA Division Office and the Agreement Officer's Technical Representative or AOTR (See section 20).

On or before June 30 of each year, the FHWA Division Office and AOTR will review the Annual Program Plan submission, and will either request revisions or approve the plan.

If required, ATLAS shall submit a revised Annual Program Plan that reflects the FHWA Division Offices review comments for final approval. As soon as practicable after approval of the Annual Plan, the FHWA Division Office will authorized the center to proceed.

The Advisory Committee shall meet twice per year to review the ATLAS ongoing research, technology transfer, and human resource development and diversity activities and advise ATLAS during preparation of the annual program plan. During its first meeting, the Advisory Committee shall develop, within the general guidelines detailed herein, an organizational and operating structure for performing these functions.

The Advisory Committee shall be informed that the annual program planning process is beginning and will be invited to provide input to the draft annual program plan. The Advisory Committee will review the Annual Plan and make recommendations to the ATLAS Center on revising the Annual Plan prior to submission to the FHWA Division Office and the AOTR. The recommendations will be documented as part of the official minutes of the meeting.

ATLAS shall prepare and distribute to the Advisory Committee a written summary of responses (i.e., revisions to the Annual Program Plan or reasons for not making revisions) to each of the Advisory Committee recommendations.

After FHWA approves the annual program plan and authorizes ATLAS to proceed with implementing the program, ATLAS shall prepare and distribute to the Advisory Committee an overview of the approved program.

The ATLAS Director shall develop and maintain administrative, financial, and technical accountability and reporting systems. The ATLAS Director shall allocate funds among the program missions and, within the research and technology transfer missions, among their respective focus areas. The Director shall designate a leader for each focus area within the research and technology transfer missions and for the human resource development and diversity missions. Each mission focus area leader shall have responsibility for accomplishing the objectives and action items within his or her mission/focus area, and shall also have responsibility for monitoring the expenditure of the funds allocated to that mission/focus area. The mission/focus area leader shall report to the ATLAS Director. The progress with respect to objectives and action items in the Annual Program Plan and the expenditure of funds shall be monitored and documented in Quarterly Progress Reports, which are described in Section 9 of this Cooperative Agreement.

6.   Directory of Key Center Personnel.

The parties to this cooperative Agreement agree that technology transfer is important to the utilization, application, and implementation of research results. Therefore, the University of Arizona shall prepare a "Directory of Key Center Personnel" in the form of a list of names,

business addresses, E-mail and fields of expertise of personnel working at or in conjunction with the ATLAS Center.

Persons listed in the Directory shall include: partnership or consortium institution leaders; principal investigator(s); contributing faculty members; and critical research staff. The Directory shall also list the names, E-mail and US Mail addresses and affiliations of appropriate Federal, State and local government transportation agency contacts and of other key individuals from the private sector, including members of the Center's Advisory Committee, if one exists.

One unbound copy of the Directory, suitable for reproduction, and one electronic copy in a form agreed to by the AOTR, shall be submitted by the ATLAS Center to the AOTR three (3) months after the effective date of this cooperative agreement. At that same time, the ATLAS Center shall submit one copy of the Directory to each of the other U.S. DOT ITS Research Centers of Excellence, and one bound copy to the FHWA Division Office.

The ATLAS Center shall update the Directory at least annually or as requested by the AOTR, but not more frequently than once every three months. Updated copies shall be included in electronic form with the quarterly report as appropriate.

7. Project Descriptions

A Project Description shall be the basis for quarterly reporting of the project status by the recipient and shall be used as the basis for the Work Orders detailed in Section 8. The Project Description shall also be used to inform external project contacts such as researchers and others who have an interest and a desire to follow research conducted on certain topics or who can facilitate technology transfer activities. Because of the large anticipated number of projects to be generated by the ATLAS Program, each Project Description shall be limited to a maximum of four pages and shall provide only essential details in a concise format.

The following information shall be included in each Project Description:

    Identifying Numbers (Recipient and U.S. DOT modal administration, if any, assigned)
    Project Title
    Principal Investigator, Institution, E-mail, Telephone Number
    External Project Contact, Address, E-mail, Telephone Number
    Project Objective
    Modal Orientation of the Project
    Project Abstract
    Task Descriptions
    Milestones, Dates (including Project start and end dates)
    Yearly and Total Budget
    Relationship to other Research or Projects
    Technology Transfer Activities (Products, Tangible Results)

Curriculum and/or training materials to be developed
Potential Benefits of the Project

Each Project Description shall be submitted with the work order request by the recipient to the AOTR and FHWA Division Office. The recipient shall submit each Project Description on Adobe Acrobat format compressed with the Acrobat Distiller and three paper copies.

8.   Work Orders.

Individual activities within the project Annual Plan agreed to be performed by the State or caused to be performed by the State shall be incorporated in Work Orders. Each Work Order will provide the information detailed in Section 7 of this agreement. Work Orders must have the signatures of the FHWA Division Administrator and an authorized representative of the State indicating acceptance of the Work Order prior to initiation of any work described therein. Issuance of a Work Order does not constitute a promise, either expressed or implied, that the FHWA will issue further Work Orders or provide additional assistance pursuant to this ITS Partnership Agreement. Continued funding will be dependent on the successful completion of ongoing tasks.

9.   Quarterly Progress Reports

The ATLAS Director shall submit three quarterly progress reports in tabular and letter form, comparing actual work performed with the projected accomplishments and milestones described in the Annual Plan and Project Descriptions. (The annual report shall substitute for the 4th quarterly report) The report shall be prepared in three sections: project status, operational status, and additional information. The emphasis of this update shall be on tangible progress, publications and problems encountered or solved.

Project Status

The principal vehicle for communicating the status of technical projects will be a summary chart, prepared as a table with the following column headings:

Identifying Numbers (Recipient and DOT modal administration, if any, assigned)
Project Title
Principal Investigator, Institution, Telephone Number
Director's Report of Progress:
    Projected Milestones have been Accomplished (Yes/No)
    Project is on schedule (Yes/No)
    Project is within budget (Yes/No)
    Changes in the Project Description (Yes/No)
Problems (current or anticipated)
Products and Tangible Results this Quarter

A discussion of entries in the Problems column and a description or rationale for negative responses to any of the reports of progress shall be attached to the table in narrative form not to exceed one page per negative response. The Products and Tangible Results section shall list products and results of related education, research and technology transfer elements. This may include such activities as communication and interaction with the transportation professionals for purposes of preparing for technology transfer activities.

The tabular format described above is to streamline the quarterly reporting of project status by the ATLAS Director to the FHWA Division Office and AOTR. It is not intended to be a substitute for more complete treatment that may be required for other reasons such as reporting directly to project sponsors and external project contacts.

Because of the way the reports are to be used, all objectives shall be reported in each report. Each objective previously reported as completed during the performance year shall continue to be shown and carry the notation that it is completed along with the quarter and year it was completed.

Additional Information

For each project title that was included in the Project Status section of the quarterly progress report, the Additional Information section shall contain a narrative describing:

(a) Accomplishments and significant findings;
(b) Recommended solutions to any problems that were described in the Project Status section;
(c) A summary showing new matching fund agreements/contracts received, and from whom received, during the reporting period.
(d) Operational Status - compares what the Center actually accomplished with what was agreed upon in the Annual Plan. The strategic planning process requires attention to be focused on the Annual Plan throughout the year and not only at the end of the year. Short term monitoring and evaluation may signal when a change or corrective action is needed. As an indicator of how well the Plan is being implemented, it will be used in Center evaluation.

One magnetic medium in computer readable Adobe Acrobat format compressed with the Acrobat Distiller, and two paper copies of each report shall be submitted to the AOTR within 30 days after the end of each Federal fiscal quarter. Submit two copies to the FHWA Division Office. The electronic versions may be submitted on read/write CD rom so that a running accumulation of all submitted reports are on the same media.

10. Annual Summary of Plan Accomplishments

The fourth Quarterly Progress Report an Annual Summary of Plan Accomplishment is due thirty (30) days after the end of the performance year The Annual Summary will provide a summary of project and operation status for the entire year. The Annual Summary shall also provide a

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financial summary report comparing the approved budget estimate with the amounts that were actually incurred (and for which reimbursement was requested during the fiscal year being reported). After the first year of this cooperative agreement, the annual financial summary shall also include cumulative totals. The Annual Summary of Plan Accomplishments shall provide much of the basis for evaluation of the center's overall performance for the year. Submit one magnetic medium in a computer readable Adobe Acrobat compressed with Acrobat Distiller format and three paper copies of the Annual Summary of Plan Accomplishments to the AOTR within 30 days after the end of the Federal fiscal year. The electronic versions may be submitted on read/write CD rom so that a running accumulation of all submitted reports are on the same media.) Submit two paper copies to the FHWA Division Office. One paper copy and one electronic copy shall also be sent to the ITS RCE clearinghouse and to the FHWA JPO ITS Electronic Clearinghouse.

The introduction to the Annual Summary of Plan Accomplishments shall state how many undergraduate, graduate, & faculty respectively, have worked on center projects. It shall also state how many bachelors, masters and PhD degrees have been awarded. It shall also state how many articles have been published, how many presentations have been made, how many reports have been produced and how many projects have been completed. Matching funds acquired shall also be reported. These numbers shall be reported both for the current year and cumulatively.

11. Narrative Summary Report

In addition to the Annual Summary of Plan Accomplishments, within thirty (30) days following the end of each performance year, each Center shall submit a Narrative Summary Report, not to exceed five (5) pages, summarizing all work done under the cooperative agreement. The report shall document the significance of the work and activities at the Center during the previous year. In addition, the report shall list products, tangible results and technology transfer activities that have been or are anticipated to have been derived from the research, PCB and technology transfer elements of the Center's work under the cooperative agreement. Typical of these are articles or papers published in professional journals, presentations made at conferences, courses developed, presented or modified and books published. The report shall summarize the benefits and beneficiaries of the year's activities. The Center's summary report shall include either a listing of all inventions made during the cooperative agreement period or a certification that no inventions were made during the applicable period. Submit 5 copies to the AOTR, with two copies to the FHWA Division Office. Submit one copy on magnetic or optical medium in Adobe Acrobat format compressed with Adobe Distiller. One paper copy and one electronic copy shall also be sent to the ITS RCE clearinghouse and to the FHWA JPO ITS Electronic Clearinghouse.

12. Project Technical Reports

The wide variety of organizations and projects within the Center program necessitate the use of three different types of technical reporting: Final technical reports, training materials, technical

papers and conference presentations, and limited distribution reports. (It is expected that most reports from Center projects will be Final Technical Reports or training materials.)

Final Technical Reports

Research from the major, comprehensive projects shall be reported in the traditional form of final technical reports. These may be interim reports in the case of multi-year projects, or final reports at the completion of the work. A final technical report shall give a complete description of the problem, approach, methodology, findings, conclusions, recommendations, etc. developed in the project and shall completely document all data gathered, analyses performed, and the results achieved for a specific activity conducted by the Center. Final Technical Reports longer than 40 pages should be accompanied by a separate executive summary report of 20 pages in length. A half page summary of the report explaining why the project is important, important findings and/or benefits , examples, who was involved in the project and target audience for the report should be included within the report - this summary should also be part of the NTIS page.

Final technical reports shall be sent to the AOTR, the JPO ITS electronic clearinghouse, and to the ITS RCE Clearinghouse in electronic form within 30 days following thorough review by peers, experts and other external project contacts. Copies of the final reports produced during the year shall also be placed on the electronic medium with the annual report.. This set shall be indexed using Adobe Professional so that the reports may be searched as a group similar to the TRB CD-ROM. The ATLAS Center shall be responsible for printing submitted reports, but FHWA may choose to reprint exceptionally meritorious reports.

Final technical reports will generally adhere to the following guidelines:

> The reports shall include an abstract (not longer than one-half page) and an executive summary of the report (not longer than 20 pages) that is suitable for separate publication.
> The reports shall be peer reviewed for technical quality either by the originating organization, the Center, other universities or ITS Research Centers, the Non-Federal sponsor, external project contact or by outside peer groups.
> Copies of the report shall be prepared for distribution with the cover of the appropriate ITS Research Center of Excellence. The reports may be published under the cover of the originating organization if necessary to satisfy non-Federal requirements, with the exception of the required copies described below.

The inside of the front cover shall show a disclaimer including, as a minimum, the following:

DISCLAIMER

The content of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. This document is disseminated under the sponsorship of the Federal Highway Administration, Federal Railroad Administration,

Federal Transit Administration and National Highway Traffic Safety Administration, ITS Research Centers of Excellence Program, in the interest of information exchange. The U.S. Government assumes no liability for the contents or use thereof.

A documentation page (DOT Form 1700.7, copy attached) shall be included in the report with the following entries:

A separate JPO ITS Electronic Clearinghouse Form shall be prepared for submitting one copy to the JPO ITS Electronic Clearinghouse.

In Block 12, Sponsoring Agency, enter the name of the appropriate ITS Research Center of Excellence.

In Block 15, Supplementary Notes, insert the statement: "Supported by a cooperative agreement from the Federal Highway Administration, Federal Railroad Administration, Federal Transit Administration and National Highway Traffic Safety Administration, ITS Research Centers of Excellence Program."

An Acknowledgments section shall be included and shall recognize that support was provided by the cooperative agreement to the ITS Research Center of Excellence.

It shall be the responsibility of each Center to ensure the following distribution of final technical reports and to notify the FHWA Division Office and the AOTR of accession numbers:

One (1) magnetic medium in Adobe Acrobat Format with Distiller (PDF), one (1) unbound camera-ready original suitable for reproduction, four (4) paper copies to the FHWA Division Office and twenty (20) additional paper copies shall be sent to the FHWA. Mailing Address:

ITS RCE Program
ATTN: David R.P. Gibson
Federal Highway Administration (HSR 10)
U.S. Department of Transportation
6300 Georgetown Pike
McLean, VA 22101

ITS Joint Program Office
Electronic Clearinghouse
ATTN: Janice Sanders
Federal Highway Administration (HVH-1)
Room 3416
400 7th St. S.W.
Washington, D.C. 20590

One paper copy shall be sent to the National Technical Information Service for inclusion in their information system. Include NTIS form No. 298 and Form No. 79, which can be obtained from the address below. (Available from the web at *http://www.bts.gov/itc/1700-7.pdf*) Provide one copy to NTIS in Adobe Acrobat Format (PDF) which has been compressed with the "Acrobat Distiller" in computer readable format on 3 ½ disk. (note: the actual electronic medium may be changed by mutual concurrence with NTIS)

Mailing Address

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield VA. 22161

Attention: Intake Department

Two (2) paper copies shall be sent to each of the following four Transportation Research Information System (TRIS) depositories:

Transportation Library
Northwestern University Library
Evanston, IL 60208

Institute of Transportation Studies Library
University of California, Berkeley
412 McLaughlin Hall
Berkeley, CA 94720

Transportation Research Board Library
2101 Constitution Avenue., N.W.
Washington, D.C. 20418

U. S. Dept. of Transportation
Library Services and Distribution Services
 Division
400 - 7th St.. S.W.
Washington, D.C. 20590

Technical Papers and Conference Presentations

Some projects arc better suited to dissemination of the research results through technical papers and presentations at conferences. This may be especially true of projects that obtain matching funds from sponsors who expect publication in this medium rather than a final report.

The following guidelines shall apply to technical papers and conference presentations:

The papers are highly technical in nature and are targeted toward a narrow audience of professionals in that field.

The papers are given peer review by the publishing organization.

The papers are not published by the ITS Research Center of Excellence.

The papers shall include an abstract not longer than one-half page.

An Acknowledgments section recognizes that support was provided by a FHWA cooperative agreement to the ITS Research Center of Excellence.

At the completion of the quarter in which the paper is presented three (3) copies of each such technical paper and one copy in electronic form (in Adobe Acrobat with Distiller) shall be forwarded to the AOTR, with the quarterly or annual report. Submit one paper copy to the FHWA Division Office. The electronic form shall be on the same medium as the quarterly or annual report. All of the reports for the year shall be on the medium with the annual report. If a presentation was made using slides, a electronic file of the slides shall be included. They shall be sent to the following address:

ITS RCE Program
ATTN: Technical Paper/Conference Pres.
Federal Highway Administration
U. S. Department of Transportation
Washington, DC 20590-0001

Limited Distribution Reports

Certain projects in a Center may not result in a research product that warrants wide distribution to the ITS community. For example, the study of a local transportation problem may be so parochial or narrow in scope that it is not considered worthwhile to disseminate the information beyond the Center. Because of its nature, such a report may not include a complete and thorough treatment of the problem. Similarly, it may not be peer reviewed.

Reports of this type shall be identified as Limited Distribution Reports and shall be subject to the following guidelines:

The inside of the front cover shall show the following disclaimer:

DISCLAIMER

The contents of this report reflect the views of the authors, who ire responsible for the facts and the accuracy of the information presented herein. This document is disseminated under the sponsorship of the Federal Highway Administration, Federal Railroad Administration, Federal Transit Administration and National Highway Traffic Safety Administration, ITS Research Centers of Excellence Program, in the interest of information exchange. The U. S. Government assumes no liability for the contents or use thereof.

An Acknowledgments section is not required, but if included, it shall recognize that support was provided by the cooperative agreement to the ITS Research Center of Excellence.

Limited Distribution Reports shall be published and disseminated in a fashion considered most appropriate by the Center, but at a minimum:

Provide a copy to the FHWA Division Office. Two (2) paper copies and one electronic copy (in Adobe Acrobat with Distiller format) shall be forwarded to the AOTR with the Quarterly Report at the end of the quarter in which the Limited Distribution Report was published. The address they shall be sent to is:

ITS RCE Program
ATTN: Ltd. Distribution Report.
Federal Highway Administration
U. S. Department of Transportation
Washington, DC 20590-0001

13. Others Forms of Technical Reports

Technical reports may be submitted in forms other than as printed documents, such as video tapes and computer programs, but only upon prior request and approval by FHWA to ensure utilization of appropriate standards.

14. Period of Performance.

The period of performance is as stated in the Work Orders. A final Technical Report shall be submitted, as noted in Section 12, and shall constitute completion of the work in that order.

15. Term of the Cooperative Agreement.

This Cooperative Agreement is in effect from the date that it is signed until the completion of the work items within the Program Annual Plan. This cooperative agreement may be extended to cover additional Program years should additional funding become available.

16. U.S. DOT Participation.

The United States Department of Transportation (U.S. DOT) agencies shall be considered full participants in the project. As such, the U.S. DOT shall be provided the opportunity for membership on all management committees, subcommittees, working groups, task forces, and other such groups related to the project. The U.S. DOT will provide names, addresses, and phone numbers of DOT participants to the State Program Manager.

17. Programmatic Changes.

The State must obtain the prior approval of the U.S. DOT whenever any significant change is anticipated. These include, but are not limited to:

a. Any revision of the scope, goals or objectives of the consultant contract or related activities (regardless of whether there is an associated budget revision requiring prior approval).
b. Changes in key personnel, program manager, or prime contractor.

18. Agreement Officer's Technical Representative (AOTR)

The FHWA Division Office has designated a Technical Representative, known as the AOTR, to assist in monitoring the work under this Cooperative Agreement. The AOTR designated for this cooperative agreement is David R. P. Gibson. The AOTR will jointly oversee the technical administration of this Cooperative Agreement with the FHWA Division Office and act as technical liaison with the performing organization for issues dealing with the National Research program or the ITS Professional Capacity Building program. The AOTR is not authorized to change the scope of work or specifications as stated in the Cooperative Agreement, to make any commitments or otherwise obligate the Government or authorize any changes which affect the Cooperative Agreement price, delivery schedule, period of performance or other terms or conditions.

19. Intellectual Property.

Intellectual property consists of copyrights, patents, and any other form of intellectual property rights covering any data bases, software, inventions, training manuals, systems design or other proprietary information in any form or medium.

It is the policy of the FHWA to allow the non-Federal partners of an ITS Partnership Agreement to retain all intellectual property rights developed under this agreement with the following limitations:

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a.   Copyrights. The FHWA, as the contracting U.S. DOT agency, reserves a royalty-free. nonexclusive and irrevocable license to reproduce, publish or otherwise use, and to authorize others to use, for Federal Government purposes:

    1.   The copyright in any works developed under this agreement, or under a subgrant or contract under this agreement; and

    2.   Any rights of copyright to which the State, its subgrantee, or contractor purchases ownership with Federal financial assistance provided by this agreement.

b.   Patents. Rights to inventions made under this agreement shall be determined in accordance with 37 C.F.R. Part 401. The standard patent rights clause at 37 C.F.R. §401.14, as modified below, is hereby incorporated by reference.

    1.   The terms "to be performed by a small business firm or domestic nonprofit organization" shall be deleted from paragraph (g)(1) of the clause;

    2.   paragraphs (g)(2) and (g)(3) of the clause shall be deleted; and

    3.   paragraph (1) of the clause, entitled "Communications" shall read as follows: "(1) Communications. All notifications required by this clause shall be submitted to the FHWA Division Office."

20. Costs.

The State shall limit its progress claims and final claims to those costs incurred in accordance with this ITS Partnership Agreement and shall submit its final claim within ninety (90) days after the project is completed.

21. Additional Requirements.

These ITS funds shall be used only in support of, or for research on, intelligent transportation systems and not for construction of buildings. The design and operation of this ITS project must be consistent with the National ITS Architecture and the purposes of section 6053(b) of ISTEA. This project shall contribute to the implementation of the ITS standards development work and shall promote interoperability of ITS systems among the States. Participation of small business concerns owned and controlled by socially and economically disadvantaged individuals is encouraged. The State shall comply with all applicable laws, regulations and the FHWA requirements, including, but not limited, to 49 C.F.R. Parts 18, 20, 21, 27, and 29, and the assurances in OMB SF 424B attached hereto as Appendix A.

22. Certification Regarding Lobbying.

The State makes the certification regarding lobbying which is attached hereto as Appendix B.

23. <u>Termination</u>.

The State shall notify FHWA immediately of any intent to terminate this ITS Partnership Agreement.

State Department   Federal Highway Administration
of Transportation

_____   _____

Title: Division Administrator

Date _____   Date _____

ARIZONA DEPARTMENT OF TRANSPORTATION
Joint Project Administration

Progress		Final		Payment Report		
Report No.	: FA : : Non FA :	: Exp. Budget : Obj. Code :		: : : Contract No. JPA 98-156 :		
TRACS No. Project No.		Date Ending				
Name of Project:						
Name Of Consultant:						
Date Started	:	: Estimated Completion Date:	:	: % Billed	: % Complete	

SUMMARY OF WORK FOR WHICH PAYMENT IS REQUESTED

Item	Description	Total Contract Amount	Previous Accumulative Amount	Current Month	Accumulative Amount
1	Per JPA 98-156	$1,000,000.00			

Submitted By:_____ University of Arizona	Date_____	: Total : To : Date	: : :	_____
Approved By:_____ ADOT Project Monitor	Date_____	: Total : Previous : Report	: : :	_____
Approved By: _____ Joint Project Administration	Date_____	: Current : Report	: :	_____